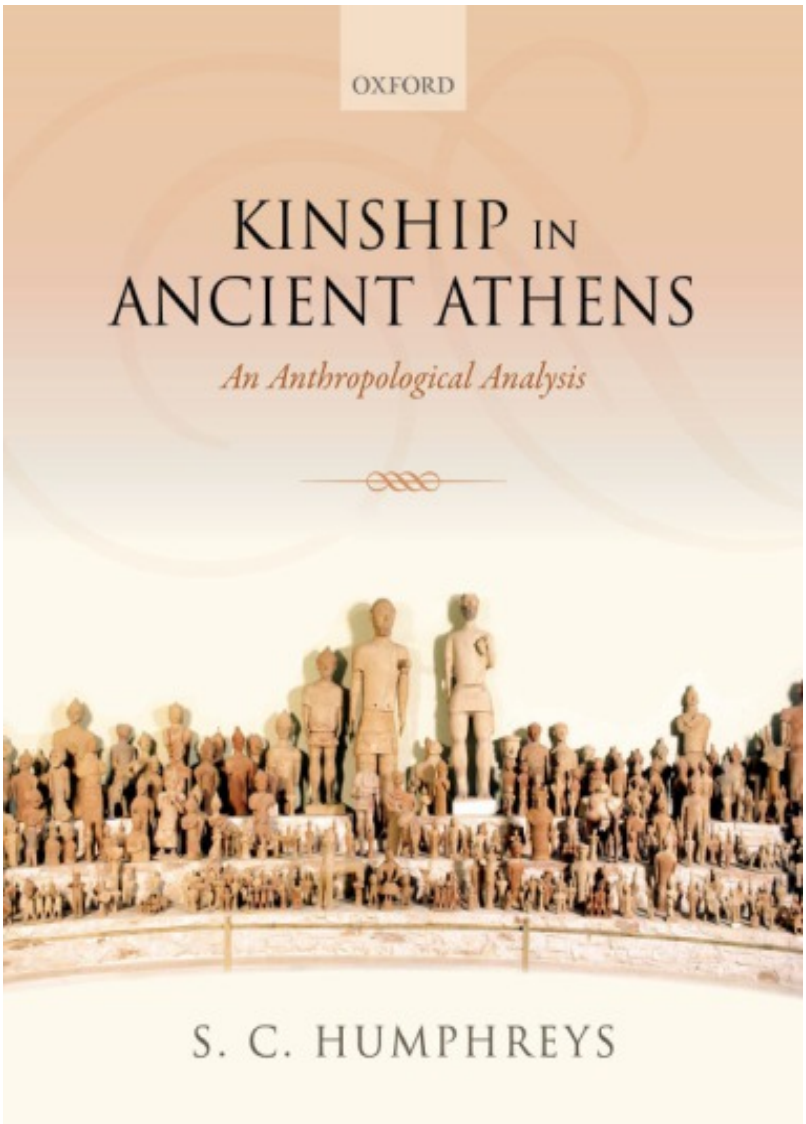
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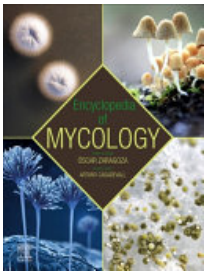



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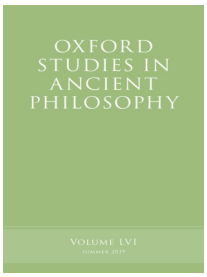
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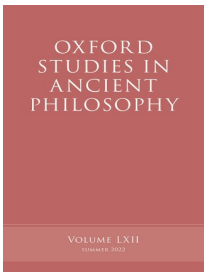

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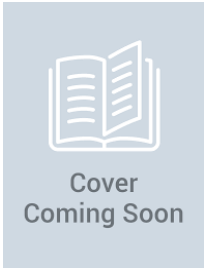

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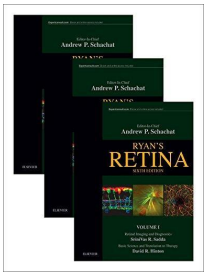

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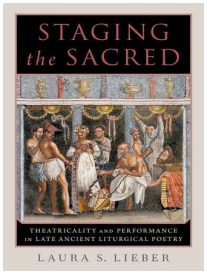
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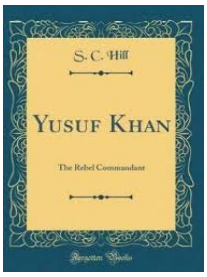

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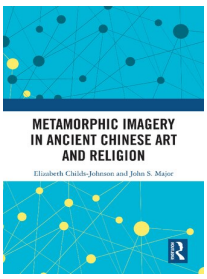

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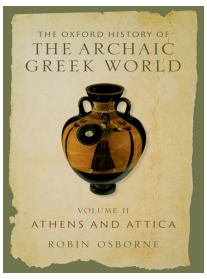

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# KINSHIP IN ANCIENT ATHENS

*An Anthropological Analysis*



S. C. HUMPHREYS

KINSHIP IN ANCIENT ATHENS

# *Kinship in Ancient Athens*

An Anthropological Analysis

Volume I

S. C. HUMPHREYS

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In Memoriam:
Michael H. Jameson
David M. Lewis
Anna Morpurgo Davies
Christiane Sourvinou-Inwood

# PREFACE

This book has been a long time in the making and has incurred numerous debts, some to friends no longer here to be thanked.

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# LIST OF ABBREVIATIONS

(Abbreviations of journal titles follow *L'Année philologique*. Anthropologists' abbreviations for kin terms are acrophonic except that Z = sister.)

| | |
|---|---|
| *AAG* | G. M. A. Richter 1944, *Archaic Attic Gravestones*. Cambridge, MA: Harvard University Press. |
| *AEE* | S. A. Koumanoudes (ed.) 1871, *Attikês epigraphai epitymvioi*. Athens: Antoniades (repr. 1993, Archaiologikê Etaireia). |
| *AEE*$^2$ | S. N. Koumanoudes and A. P. Matthaioiu (eds) 1993, *Attikês epigraphai epitymvioi: prosthekai*. Athens: Archaiologikê Etaireia. |
| *AG I* | W. Peek 1954, *Attische Grabschriften* I. *ADAW* 1953. 2. |
| *AG II* | W. Peek 1957, *Attische Grabschriften* II. *ADAW* 1956. 3. |
| *AGC* | M. Petropoulakou, and E. Pentazos 1973, *Archaies Ellênikes Poleis 21. Attikê*. Athens: Center of Ekistics. |
| *Agora III* | R. E. Wycherley (ed.) 1957, *The Athenian Agora III: Literary and epigraphic testimonia*. Princeton: ASCS. |
| *Agora XI* | E. B. Harrison 1965, *The Athenian Agora XI: Archaic and archaistic sculpture*. Princeton: ASCS. |
| *Agora XIV* | H. A. Thompson and R. E. Wycherley (eds) 1972, *The Agora of Athens*. Princeton: ASCS. |
| *Agora XV* | Meritt, B. D., and J. S. Traill (eds) 1974, *The Athenian Agora XV. Inscriptions: the Athenian Councillors*. Princeton: ASCS. |
| *Agora XVI* | A. M. Woodward (ed.) 1997, *The Athenian Agora XVI. Inscriptions: the decrees*. Princeton: ASCS. |
| *Agora XVII* | Bradeen, D. W. 1974, *The Athenian Agora XVII. Inscriptions: the funerary monuments*. Princeton: ASCS. |
| *Agora XVIII* | Geagan, D. J. † 2011, *The Athenian Agora XVIII. Inscriptions: the dedicatory monuments*. Princeton: ASCS. |
| *Agora XIX* | G. V. Lalonde, M. K. Langdon, and M. B. Walbank (eds) 1991, *The Athenian Agora XIX. Inscriptions: Horoi, Poletai Records, Leases of public lands*. Princeton: ASCS. |
| *Agora XXI* | Lang, M. 1976, *The Athenian Agora XXI: Graffiti and Dipinti*. Princeton: ASCS. |
| *Agora XXV* | Lang, M. 1990, *The Athenian Agora XXV: Ostraka*. Princeton: ASCS. |
| *Agora XXVIII* | A. L. Boegehold (ed.) 1995, *The Athenian Agora XXVII: the Lawcourts at Athens*. Princeton: ASCS. |
| *Agora XXXI* | M. M. Miles (ed.) 1998, *The Athenian Agora XXXI: the City Eleusinion*. Princeton: ASCS. |
| *Agora XXXV* | J. B. Grossman 2013, *The Athenian Agora XXXV: funerary sculpture*. Princeton: ASCS. |

| | |
|---|---|
| *AO* | R. Develin 1989, *Athenian Officials 684–321 BC*. Cambridge: CUP. |
| *A.P.* | [Aristotle], *Athenaion Politeia*. |
| *APF* | J. K. Davies 1971, *Athenian Propertied Families 600–300 BC*. Oxford: Clarendon Press. |
| *ARMA II* | G. E. Malouchou-Daïliana (ed.) 1993, *Archeion tôn mnêmeiôn tôn Athênôn kai tês Attikês* II. Athens: Archaiologikê Etaireia no. 136. |
| *ARMA IV* | O. Vizenou (ed.) 2007, *Archeion tôn mnêmeiôn tôn Athênôn kai tês Attikês* IV. Athens: Archaiologikê Etaireia no. 247. |
| *A to Z* | S. Kapranides and N. Photes 1997, *Athena-Peiraias Proasteia: Chartes-odegos*. 23rd ed. Ambelokepoi: Kapranidis and Fotis |
| *BAR* | *British Archaeological Reports*. Oxford: Archaeopress. |
| *BArch* | The Beazley Archive (www.beazley.ox.ac.uk). |
| *BE* | Bulletin épigraphique, published in *REG*. |
| *BGU* | *Berliner griechische Urkunden*. Berlin: Reimer. |
| *CAT* | Clairmont, C. 1993, *Classical Attic Tombstones*. Kilchberg: Akanthus (*Supplementary Volume*, 1995). |
| *CAVI* | H. R. Immerwahr 1998–2009, *A Corpus of Attic Vase Inscriptions*, see http://www.lib.unc.edu/dc/attic with http://avi.unibas.ch/home.html. |
| *CEG* | P. A. Hanson 1983, 1989, *Carmina epigraphica Graeca*, Berlin: de Gruyter. |
| *CID I* | Rougemont, G. 1977, *Corpus des inscriptions de Delphes. I. Lois sacrées et règlements religieux*. Paris: de Boccard. |
| *CIERGA* | Centre International d'Étude de la Religion Grecque Antique. |
| *Corinth XX* | C. K. Williams and N. Bookidis 2003, *Corinth: the centenary: 1896–1996*. Princeton: ASCS. |
| *CSSH* | *Comparative Studies in Society and History*. Cambridge: Cambridge University Press. |
| *DAA* | A. Raubitschek 1949, *Dedications from the Athenian Acropolis*. Cambridge, MA: Archaeological Institute of America. |
| *DGE* | E. Schwyzer 1923, *Dialectorum graecarum exempla epigraphica potiora*. Leipzig: Teubner (repr. Hildesheim; Olms 1960). |
| *dr.* | *drachma/ai* |
| *EAA* | *Enciclopedia dell'arte antica* (1958– ). |
| *FD* | *Fouilles de Delphes III* 1929– . Paris: de Boccard. |
| *FGE* | D. L. Page 1981, *Further Greek Epigrams*. Cambridge: Cambridge University Press. |
| *GG* | W. Peek 1960, *Griechische Grabgedichte*. Berlin: Akademie-Verlag. |
| *GVI* | W. Peek 1955, *Griechische Vers-Inschriften I. Grab-Epigramme*. Berlin: Akademie-Verlag. |
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# Exploring the Variety of Random Documents with Different Content

# THE HAND

## PHRENOLOGICALLY CONSIDERED

# THE HAND

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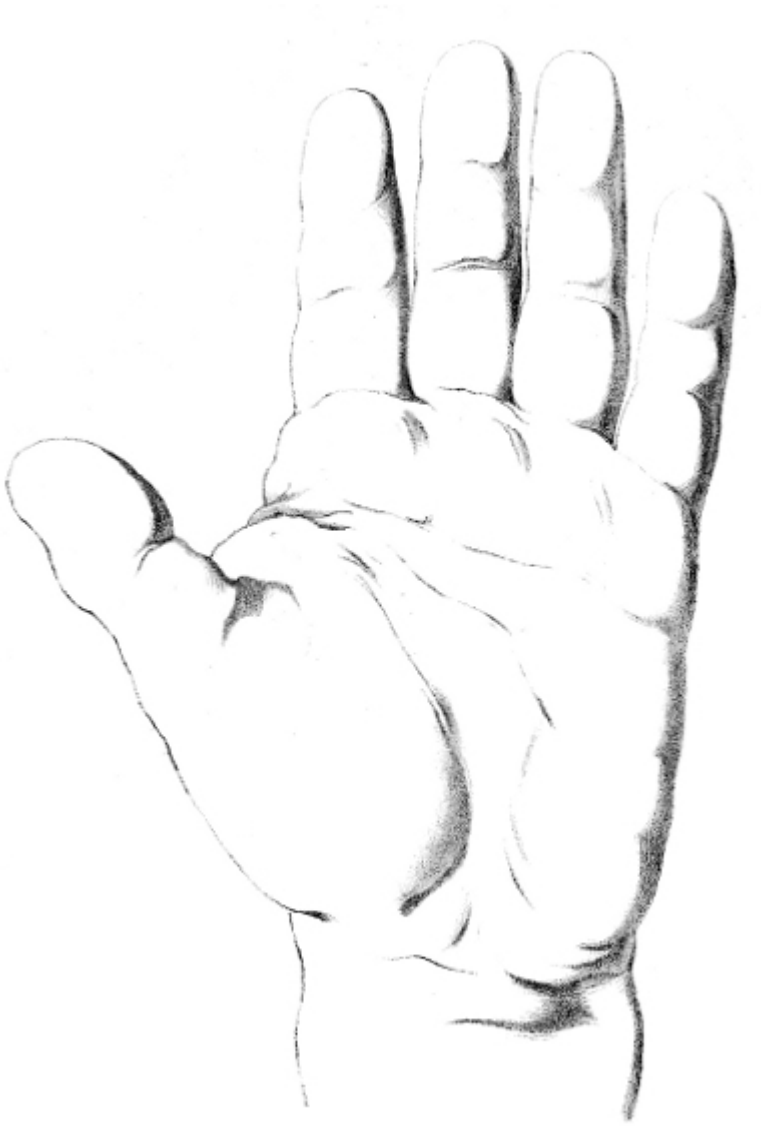
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Plate 1.



Elementary Hand.

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# THE HAND

# PHRENOLOGICALLY CONSIDERED:

BEING

## A GLIMPSE AT THE RELATION OF THE MIND WITH THE ORGANISATION OF THE BODY.

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LONDON:
CHAPMAN AND HALL, 186 STRAND.
M.DCCC.XLVIII.

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*"Les hommes ne peuvent en quelque genre que ce soit arriver à quelque chose de raisonnable, qu'après avoir en ce même genre, épuisé toutes les sottises imaginables."*—FONTENELLE.

*"Si la nature, au lieu de mains et de doigts flexibles, eut terminé nos poignets par un pied de cheval; qui doute que les hommes, sans arts, sans habitations, sans défense contre les animaux, tout occupés du soin de pourvoir à leur nourriture et d'éviter les bêtes féroces, ne fussent encore errans dans les forêts comme des troupeaux fugitifs?"*—HELVETIUS, *Sur l'Esprit*.

"Manus sunt artium organa; sicut lyra musici, et forceps fabri."—GALEN.

LONDON:
GEORGE BARCLAY, Castle Street, Leicester Square.

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# PREFACE.

SINCE the time of JOHN INDAGINE, who published his "Art of Chiromancy" in 1563, but little progress has been made in the study of the hand as an indication of the physical and mental peculiarities of the individual. In our time, by the publication of the classical work of Sir C. BELL "On the Hand," public attention has been once more directed to the form, structure, and uses of this important organ.

The varieties in the structure and conformation of the human hand which are met with in different individuals have recently been investigated with much success, both in France and Germany.

It is to D'ARPENTIGNY, a translation of whose work[1] is now in course of publication in the "Medical Times," that we are indebted for much of the information we possess as to the mutual relation existing between particular mental tendencies and certain definite forms of hand. By Professor CARUS, of Dresden,[2] the views of D'ARPENTIGNY have been in part verified, and at the same time considerably extended. He has corrected much that was erroneous, and endeavoured to establish a science of CHIROLOGY, founded upon the anatomy and physiology of the hand.

I have availed myself freely of the materials collected by D'ARPENTIGNY and CARUS, and have modified, corrected, or omitted their theories and statements when not in accordance with my own experience. Much new matter has been added, and the whole arranged in a form which it is hoped may tend somewhat to contribute either to the amusement or instruction of the Reader.

*June 1848.*

# THE HAND

# PHRENOLOGICALLY CONSIDERED,

*&c. &c.*

# CHAPTER I.

"The form and posture of the human body, and its various organs of perception, have an obvious reference to man's rational nature; and are beautifully fitted to encourage and facilitate his intellectual improvement."—DUGALD STEWART, *Moral Philosophy*.

## THE BRAIN THE ORGAN OF MIND.

FROM the time of Thales and Pythagoras to our own day the opinions of metaphysicians have been divided with respect to the mode in which ideas take their origin. Some, with Descartes and Leibnitz, have contended that the faculties of the mind are innate—that is, that they originate solely from within; while others, with Locke and Condillac, affirm that they are acquired, and in all cases derived, from impressions received through the medium of the senses, —"Nihil est in intellectu quod non prius fuerit in sensu."

However it may be with respect to this controverted point, whether ideas originate from without or from within, it is at least certain that the manifestations of the mind, far from being independent of, are, on the contrary, closely linked and connected with, the conditions of matter. Hippocrates, when sent for by the Abderites to cure Democritus of his supposed madness, found him busily engaged in dissecting the brains of animals for the purpose of ascertaining the organs and causes of thought. That the brain is the organ through which the manifestations of mind are made known to us, was therefore suspected by Democritus; and the accumulated experience of centuries has rendered that a certainty which with him was but a mere conjecture. In the language of an eloquent modern writer, "Where shall we find proofs of the mind's independence of the bodily structure,—of that mind which, like the corporeal frame, is infantile in the child, manly in the adult, sick and debilitated in disease, frenzied or melancholy in the madman, enfeebled in the decline of life, doting in decrepitude, and annihilated by death?"

Admitting, then, that the brain is the organ of mind—the instrument by which we are rendered cognisant of our own mental operations and conceptions—it must be evident that, for the purpose of making them known to others, of carrying them into effect, certain other parts become necessary, the conception requiring instruments for its execution. This important duty is intrusted to the care of the senses, and for this reason they have been correctly termed the hand-maidens of the intellect, as it is through their agency that the brain receives and transmits impressions. Hence the manifestations of mind are indicated and expressed by the outward form; for the senses can act only through the medium of physical organs, and with these latter the active phenomena of life must necessarily be in strict accordance. Thus, from the external configuration of the body, or of some of its parts, we can legitimately draw conclusions respecting the degree and kind of mental power. Let us examine this proposition a little more in detail. In his *Instauratio Magna*, Bacon relates that "when he was a young man at Poictiers in France, he conversed familiarly with a certain Frenchman, a witty young man, but something talkative, who afterwards grew to be a very eminent man. He was wont to inveigh against the manners of old men, and would say, that if their minds could be seen as their bodies are, they would appear no less deformed; he would also maintain that the vices of old men's minds have some correspondence and were parallel to the putrefaction of their bodies. For the dryness of their skin, he would bring in impudence; for the hardness of their bowels, unmercifulness; for the lippitude of their eyes, an evil eye and envy; for the casting down of their eyes and bowing their bodies toward the earth, atheism (for, saith he, they look no more up to heaven as they were wont); for the trembling of their members, irresolution of their decrees and light inconstancy; for the bending of their fingers, as it were to catch, rapacity and covetousness; for the buckling of their knees, fearfulness; for their wrinkles, craftiness and obliquity."

Now, without hoping to attain to the nice discrimination of this ingenious young gentleman, we shall attempt to elucidate a few

general facts connected with this part of our subject.

With that spirit of observation for which they were so eminently remarkable, the ancients had long since remarked the constant connexion of certain peculiarities of outward form with particular modes of thinking—a correspondence between the physical and mental condition. It was in accordance with this view that Galen founded his celebrated doctrine of temperaments. His distinction of the sanguine, phlegmatic, choleric, and melancholic temperaments, was based upon the notion of the Greek philosophers, that there were four primary constituents of the human body corresponding to the four supposed elements of nature, and that the presence of the one or the other of these elements in excess occasioned the production of the different temperaments. According to the definition of the able physiologist Müller, the temperaments are peculiar, permanent conditions, or modes of mutual reaction of the mind and organism, and they are chiefly dependent on the relation which subsists between the strivings or emotions of the mind and the excitable structure of the body. Even if we may be disposed to contend that they are not absolutely *dependent* on any particular constitution of the body, it must still be conceded that they are at least *associated* with certain peculiarities of outward organisation, by which they may be readily recognised; so that the physical structure, the mental tendency, and the character of ideas, are always intimately connected. Thus persons of a sanguine or sensitive temperament are, for the most part, of moderate stature and *embonpoint*, with a smiling florid countenance, and light or chestnut hair. Their ideas, like their physiognomy, are all *couleur de rose*. Endowed with great excitability, they are easily moved; but impressions are not durable, giving place quickly to other and newer emotions. Hence their life is made up of transitions—now grave, now gay; now happy, now miserable: their feelings are perpetually changing, and impressions made upon their mobile minds become soon obliterated by some fresh object of attention.

The phlegmatic, or elementary temperament, is characterised by a persistence during adult existence of the physical structure proper to

early life. The body is loaded with cellular tissue and fat; the muscles are large, but soft, and with indistinct outlines; the countenance is pale; the physiognomy but little marked, and the features not sharply defined. Such persons are unexcitable, their sensations are dull, and the modes of reaction which they determine slow and apathetic; their ideas are clear, but they possess neither the quickness of conception and imagination of persons of the sanguine, nor the energy of action and strong passions of those of the choleric temperament. They love repose, and excel in occupations which demand patience and attention, of which they are possessed in a remarkable degree.

In individuals of the choleric, or motive temperament, the bony frame-work of the body is strong and much developed; the articulations are large and prominent; the muscles firm, with but little cellular tissue and fat; the physiognomy decided, with sharply-chiselled features. Such individuals are remarkable for promptitude and energy of action; impetuous, passionate, and endowed with great determination, opposition only increases their endurance, and excites a proportionate effort to conquer it. In nature these temperaments are not frequently encountered pure and free from admixture, but mostly more or less mixed the one with the other. That must be held to be the most perfect temperament in which they are all blended in such proportions that neither is in excess; "in which moderate excitability is combined with a due amount of energy of action; in which imagination is tempered by reason, and the ideas and conceptions are regulated by judgment, and rectified by reflection." Impressions thus do not react upon all in the same manner. In some they are like figures traced upon the sand of the sea-shore, which are obliterated by the first advancing wave; they pass away together with the ideas to which they give rise, without leaving any, even the slightest evidence, of their existence. In others they are as characters deeply graven upon metal; arousing the attention with an irresistible force, they enchain and captivate the faculties, ceasing but to leave behind them a powerful and lasting impression upon the mind.

## EFFECTS OF AGE, SEX, CLIMATE, ETC. UPON MIND.

By age, sex, locality, climate, and regimen the mental operations are likewise powerfully influenced. By locality and climate we do not mean air and temperature merely, but the sum total of all influences, whether physical or moral, by which in every place we are surrounded. The bodily structure is undoubtedly and materially influenced by climate. Of this the modern Hungarians afford a most convincing proof—a race of people of a fine physical conformation, and yet, as their language and traditions attest, derived from the same stock as the barbarous, deformed Ostiaks inhabiting the Uralian Chain, to whom, as we learn from history, they bore no slight resemblance, on their arrival in the countries in which they are at present located. Climate may thus affect the mind in two ways, by modifying the structure of the body, and by the more direct action which it exerts upon the mind itself; and it is to these two causes that we must ascribe the differences in the form and habits, the government and laws, the superstitions and literature, of northern and southern nations.

To differences and modifications of structure constantly correspond differences and modifications in ideas and passions. The physical form and intellectual qualities are closely and mutually connected. Thus, one individual may excel another in a given pursuit, this excellence resulting rather from a peculiar aptitude for, than from a particular devotion to, its cultivation.

This aptitude, in many cases at least, is to be mainly referred to some peculiarity of structure in one or more of the organs of the senses; it is original, and without the particular organic conformation could never have been acquired by centuries of practice and experience.

## BODILY SUFFERING DEPENDENT UPON ORGANISATION OF NERVOUS SYSTEM.

To differences in the degree of sensibility of the nervous system, together with the varying amount of the peripheral ramifications

distributed to the external surface, must be ascribed the different amount of suffering experienced upon the application of inordinate stimuli to the nerves. The will is undoubtedly capable of exerting very great control over the manifestations of feeling called forth by such painful impressions upon sentient nerves. Of this Roman history affords us many notable examples. But it seems probable that the Romans were not endowed with a nervous system so delicately organised as that of the more highly civilised Greeks; witness the general structure of their language and their comparative inferiority in the fine arts. Neither heroism, nor philosophy, nor even religion, can prevent some organisations from exhibiting manifestations of great pain from impressions upon nerves, which in others would occasion but a moderate amount of suffering; a physical necessity compels them to manifest evidences of intense feeling; and thus, by a rude shock inflicted upon the nervous system, a mathematician may be at once recalled from the contemplation of other spheres, or a metaphysician from the most sublime speculations on the nature and essence of the Deity.

In the lowest grades of society the general nervous sensibility is mostly obtuse; in the highest, on the contrary, it is frequently morbidly acute: in the one case the mental manifestations are dull and obscure; in the other they may be brilliant, but are frequently wanting in strength and energy.

In his treatise on tropical diseases, Dr. Mosely observes, that "Negroes are void of sensibility to a surprising degree. They are not subject to nervous diseases. They sleep soundly in every disease, nor does any mental disturbance ever keep them awake. They bear chirurgical operations much better than white people; and what would be the cause of insupportable pain to a white man, a Negro would almost disregard. I have amputated the legs of many Negroes, who have held the upper part of the limb themselves."

# CHAPTER II.

"Sollt es wahr Sein....
Dasz die Menschengestalt, von allen sichtlichen Dingen
Ganz allein uns lügt, dasz wir, was edel und albern,
Was beschränkt und grosz, im Angesicht zu suchen,
Eitele Thoren sind, betrogne, betrügende Thoren."
GÖTHE.

## COUNTENANCE INDEX OF MIND.

TALLEYRAND was wont to say, that speech was given to man for the purpose of concealing his thoughts. Among mankind in general the countenance may, with equal force, be said to represent a series of hieroglyphics by which the internal emotions of the mind may be readily deciphered. Observe a child thrown for the first time among a number of strangers. To some it will immediately, and as it were instinctively, attach itself, while to others it will manifest the greatest repugnance and dislike. Such first impressions are not the result of reasoning, they spring from the quickness of perception peculiar to childhood; and the choice is in general not the less happy, although the reason may have had no effect in determining it. With a rapid glance a mere infant will seize the prevailing expression of the physiognomy, and detect at once the mental constitution of those by whom it is surrounded; for pride and impatience, and kindness and benevolence, are written on the plastic countenance in broad legible characters, though the many, with their blunted perceptions, may, to a certain extent, have lost the key to their solution. Contrast the expression of the physiognomy of some of the more celebrated among the ancients, as exemplified in the collection of antique busts preserved in the museum of the Capitol at Rome. Compare the broad open brow and finely-chiselled features of Trajan, or the beauty, majesty, and grace expressed in the countenance of either of

the Antonines, with the coarse, heavy, animal face of Vitellius, or the dull, morose expression of Caligula or of Commodus,—

> ———"Without a ray
> Of mind, that makes each feature play
> Like sparkling waves on a sunny day."

The difference is as striking as that which we know from daily observation to exist between the face of a rogue and that of an honest man; indeed, we are disposed to believe, with Benjamin Franklin, "that if rogues knew the advantages attached to the practices of the virtues, they would become honest men from mere roguery." It was for this reason, probably, that beauty of form and proportion were so highly prized by the ancients; and when they prayed the gods to grant them the beautiful with the good, was it not because by experience they had found that in fact they were most frequently associated? In support of this position, we may cite the authority of Bacon, who, in his Essay on Beauty, remarks, "that Augustus Cæsar, Titus Vespasianus, Philip le Bel of France, Edward IV. of England, Alcibiades of Athens, and Ismael the sophi of Persia, were all high and great spirits, and yet the most beautiful men of their time." Again, the physiognomy of the passions affords us further proof that the emotions of the mind betray themselves by peculiar corporeal phenomena,—each having, as it were, its own proper dialect. Notice the expression of the passions which follow each other in such quick succession, and are so forcibly depicted upon the mobile countenance of an infant, even before any voluntary movements can be executed by the feeble and powerless limbs. Look at a coward, his countenance blanched, and almost cadaverous,—the heavy limbs drooping and powerless,—the instruments of life paralysed, as though the fountain of existence were suddenly dried up. For grief, take the testimony of Byron, where he describes its effects in producing

> "The intersected lines of thought,—
> Those furrows which the burning share
> Of sorrow ploughs untimely there,—
> Scars of the lacerated mind
> Which the soul's war doth leave behind."

Regard a man under the influence of a sublime or heroic thought, with his head proudly elevated and nostrils dilated,—he raises himself to his utmost height; while, at the idea of infinity, or the prospect of a boundless expanse, the arms are involuntarily extended as though he would soar away into unlimited space. The impress of pride is stamped in the bold erect bearing, and that of fear in the drooping head and timid step. So true is it that joy and sorrow, love and hate, pain and pleasure, virtue and vice, all betray themselves by their organic signs, that when any of these affections are habitual, or frequently recur, their external manifestations become permanently marked in the form; and it is in this sense that the habits and emotions of early youth stamp the lineaments with a character never to be effaced, or which, in *many cases* at least, are destined to endure through life. Are we not then justified in concluding, that the kind and degree of mental developement,—the presiding thought,—the ruling and predominating principle of life, is influenced by the physical temperament and constitution, and that this latter is in its turn reacted upon by the mind?

## PARTICULAR PARTS OF ORGANISM INDICATIVE OF MODE OF LIFE AND MENTAL TENDENCY.

We have next to inquire, whether that which is undoubtedly true with respect to the whole does not also obtain with respect to a part? whether, in fact, from the examination of a small portion of an organism—an extremity, for example—we should be enabled to determine the nature, mode of life, and mental tendency of the being to which it belonged? For a satisfactory solution of this important question we must appeal to the testimony afforded by the animal world.

# CHAPTER III.

"Bestimmt Die Gestalt die Lebensweise des Thieres
Und die Weise zu leben sie wirkt auf alle Gestalten
Mächtig Zurück."—GÖTHE, *Metamorphose der Thiere*.

## CORRESPONDENCE BETWEEN FORMS AND HABITS OF ANIMALS.

The most simple observation renders at once apparent a correspondence between the external form of animals, the general direction of their tendencies, and their habits.

Let us examine this question at somewhat greater length. From the age of Aristotle to the present time, zoologists have arranged the almost countless tribes of animals into a number of groups or divisions, more or less related in general habits and structure. All the classifications which have been hitherto proposed may be referred to one or the other of two general principles. Either the colour of the blood (Aristotle), the conformation of the heart (Hunter), the arrangement of the nervous system (Owen), or some other peculiarity of *internal* structure, has been selected as the basis of arrangement; or the animal creation has been grouped according to certain definite circumstances connected with outward form and configuration. As regards their internal organisation, the variations in the structure and arrangement of the nervous system affords by far the best means of classifying animals, and the whole animal world has accordingly been divided into five primary divisions. We have already endeavoured to prove that the manifestations of mind are only made known to us through the medium of corporeal organs, whatever may be the nature of its essence. By the state of the nervous system volition is modified or controlled, the operation of the senses accelerated or retarded, the muscular movements rendered feeble and uncertain, or strong, vigorous, and energetic; in fine, the chief manifestations of life, thought, volition, and

independent motion, are all regulated by the condition and structure of the central nervine masses.

### APPENDAGES TO THE TRUNK A KEY TO THE ENTIRE ORGANISATION AND HABITS OF ANIMALS.

The appendages to the trunk, like the arrangement of the nervous system, furnish also a leading peculiarity of structure, and they may be selected as the basis of a classification founded upon outward form. For the most part, destined either for the purposes of locomotion, or to assist in the procuring of food, they must of necessity be in perfect accordance with the nervous and nutritive systems. Hence the capacities, powers, and general habits of an animal, must be in correspondence with this part of its organisation; so that when we are acquainted with the form and arrangement of the extremities of an animal, a key is thereby afforded to its entire organisation. Both its external configuration, its mode of life, and its internal structure, must harmonise, and be in accordance with the arrangement of the extremities. Its breathing and vascular apparatus, its nutritive and generative systems, are thus all indicated to us; and from a knowledge of one particular we may safely and surely predicate the nature of the rest.

*Annelida.*—Thus in the worms (*Annelida*), creatures exhibiting but few of the higher manifestations of life, we find the appendages to the trunk in their simplest form,—that of fine, minute bristles attached to the several rings or segments of the body. In the sea-mouse (*Aphrodita*), their bristles attain a somewhat higher developement, each of them being connected with a distinct elevation, or mammillary process, with which it is, as it were, articulated.

*Myriapoda.*—In the Centipedes, the first evidence of a well-formed extremity makes its appearance in the form of numerous articulated legs terminated by simple points. These legs, rudimentary in the lowest species (*Iulidæ*), in harmony with their retiring habits and vegetable diet, are divided into distinct joints, and provided with

proper muscles, in the strong and carnivorous varieties (*Scolopendridæ*). In these latter animals, the ventral nervous ganglia are also increased in size, in a ratio proportioned to the higher and more complex structure of the appendages to the trunk.

*Insects.*—In insects, creatures distinguished by so many and such admirable instincts, and endowed with such active powers of locomotion, the appendages to the body, both legs and wings, are perfectly and beautifully formed. The former, six in number, are attached to the three first thoracic segments of the body, composed of distinct articulations, connected by ligaments and muscles, and furnished with a series of minute breathing tubes, or tracheal ramifications, extending throughout their entire substance. The latter—the wings—vary much in their number, form, and arrangement; and it is upon characters furnished by them that the nearest approximation to a perfect classification of insects—that of Burmeister—is based. Thus, the legs are typical of the class, the wings characterise the orders.

*Arachnida.*—In the spider tribe (*Arachnida*) the legs, in their general structure, resemble those of insects; but they are eight in number, and, in addition to them, these creatures are provided with remarkable claw-like appendages to their jaws—mere organs of feeling in the mites, but strong and powerful instruments of prehension in the scorpion tribe.

*Crustacea.*—The crab and lobster tribe (*Crustaceans*) are likewise accurately characterised by the appendages to the trunk, the number and disposition of these parts having been employed by Milne Edwards for the purpose of dividing these creatures into a number of orders.

*Mollusca.*—Among the mollusks, the classes are nearly all named from the peculiarities in form or the position of the feet. We have the barnacles (*Cirrhopoda*), animals with six pair of articulated flexible arms, composed of a series of small pieces studded with minute hairs, and which form, when they are extended, a species of net by means of which the animal catches its prey. The *Branchiopoda*—

creatures such as the *Terebratula*—with two long fleshy arms placed near the mouth, which are hollow, muscular, and disposed in spiral folds. We have the *Tunicata*, such as *Ascidians* and the *Conchifera*, as the oyster and mussel, beings which are destitute of members, and all but incapable of locomotion. The *Gasteropoda*, of which the slug and snail afford familiar examples, and that are furnished with a locomotive apparatus peculiar to the whole class, and termed the foot or ventral disc. The *Pteropoda*, nearly allied to the *Gasteropoda* in their internal organisation, but differing from them in the possession of two broad fleshy expansions, resembling fins, which are attached to the side of the neck, and are well adapted for swimming. And, lastly, we have the *Cephalopoda*, such as the nautilus and cuttle-fish, creatures with numerous strong muscular arms attached around the head, and in some species provided with sucking discs, by means of which they are enabled successfully to attack and capture the strongest and most active prey. In all these instances we clearly see that the appendages characterise the class, and that, from an acquaintance with their number and arrangement, a naturalist could readily come to a conclusion as to the affinities, structure, and general habits of any animal in the series.

*Fishes.*—The fishes are divided into two great natural orders—those furnished with a bony skeleton and those in which the framework of the body is cartilaginous. The former division are distinguished by the possession of a swimming bladder, and by the nearly equal developement of the parts corresponding to the extremities—the pectoral and ventral fins. The pectoral fins, situated immediately behind the head, are present in all the osseous fishes, traces of them being found even where they might be supposed to be entirely wanting, as in the eel; they do not, however, attain any very considerable size, rarely equalling, and never surpassing, the magnitude of the ventral fins. In the cartilaginous fishes, on the contrary, not only in those which ordinarily remain quiet at the bottom of the water, as the skate, the sole, the flounder, and other flat fishes, but even in the active and voracious sharks we find no swimming-bladder. In these cases, its place is supplied and its duty

performed by the enormously developed anterior member or pectoral fin, which greatly surpasses the ventral fin in size; and it is by means of the active movements of this large hand that these creatures raise themselves from the bottom of the water to the surface.

*Reptiles.*—In the class of reptiles the characters afforded by the form of the extremities are not less important. Of the four orders into which this class is divided, one—that of the serpents (*Ophidia*)—is altogether destitute of members, with the exception of the rudimentary traces of extremities met with in some few species (*Anguis*, *Bimanes*, and *Seps*). In another order, that of amphibious animals (*Batrachia*), as the frogs, toads, &c., the extremities are still typical of certain peculiarities of organisation. Some of these creatures may be said to remain in an imperfectly developed or embryonic condition during their whole existence. Instead of breathing in adult life by means of lungs, as do the more perfectly organised of the *batrachia*, they retain throughout existence that peculiar structure of the respiratory apparatus—the branchial tufts—which in the latter are present but in the embryo condition. In those of the amphibious animals which breathe by means of permanent branchia (*Perenni-branchiata*), such as the *Lepidosiren* and the *Proteus*, the extremities are either mere filamentary appendages, or at most but very imperfectly-formed organs, and always typical of their comparatively inferior organisation; while, in the higher species, that is, those provided with lungs, and losing their branchiæ in the adult state (*Caduci-branchiata*), as the frog, the salamander, &c., the extremities are well formed and perfectly developed. The third order of reptiles—that of the lizard tribe (*Sauria*)—is made up of members very dissimilar both in their appearance and general habits. In the aquatic crocodiles the toes are connected by means of a membrane; like ducks and other aquatic animals, these creatures are web-footed. The alligator, so nearly allied to the crocodile in structure and habits, with the exception that it is more terrestrial in its nature, is furnished with a foot the toes of which are only webbed in half their length, the other half being free and unconnected by membrane,

their amphibious mode of life being indicated by their foot. If we compare the foot of these creatures with that of the true lizards, the difference of structure will be found to be considerable. The foot of the true lizard is provided with five toes to both the fore and hind members, while attached to the hinder members of crocodiles and alligators we find but four toes. The toes of the lizard are not connected by a membrane, but are separate, and armed with nails, for these creatures live on land, and have need of well-constructed locomotive organs to enable them to catch their active prey. Among lizards, that remarkable animal the chameleon, that is provided with a particular structure of the skin, whereby its change of colour is effected, is distinguished by the possession of a member, the structure of which is not less peculiar. The toes are arranged in two packets, which are capable of being brought into opposition—a structure admirably adapted to the mode of life of the animal—the climbing of trees and shrubs in pursuit of insects. The ichthyosaurus and plesiosaurus, creatures of the lizard tribe which have now become extinct, are both characterised by the form of their extremities. The former has four members like paddles, each composed of nearly a hundred small bones of an irregular polygonal shape and arranged in a pavement-like form. The latter has also four paddle-shaped extremities, but the number of bones of which each is composed is much less than in the ichthyosaurus—not above fifty, the pieces being at the same time of a different shape, and not arranged in a tessellated form.

*Birds.*—Among birds the foot is a most important organ, serving at once for support, prehension, and locomotion. Its modifications are accordingly very numerous, and ornithologists have employed the characters presented by it as a basis of classification. Scopoli, in his Introduction to Natural History (1777), proposed a systematic distribution of birds into two divisions founded upon the form of the scales covering the foot; thus, some are furnished with scales, small and polygonal (*Retepedes*), while others (*Scutipedes*) have the legs covered in front with unequal semicircular plates. So, again, in the division of birds proposed by Nitzsch, viz. into the aerial, terrestrial,

and aquatic, the foot will at once serve to indicate the different orders. We will proceed to examine the special characters afforded by the foot of birds in each of the groups or orders, adopting the classification of Kirby, one of the most recent.

In the first order, the birds of prey (*Raptores*), which includes the eagle, the vulture, the owl, &c., for the purpose of striking their quarry, and of securing it by a firm grasp, a strong muscular foot is necessary, and we consequently find that the foot is provided with four short muscular toes, three placed before, and one behind, all armed with long, sharp, hooked talons, those of the thumb and innermost toe being the longest, as the great duty of grasping is mainly performed by them. The claws are also capable of being drawn back, they are retractile like those of the cat; and the scales upon the upper surface of the foot, as well as the skin covering it below, are strong and tough for the purpose of protecting the member from the attacks of the living prey upon which these creatures feed. The foot is also broadly marked, the kind of marking and the size of the scales being especially characteristic of the different genera and families. In the vultures, which from their feeding on carrion do not require such strength of foot, we find a notable deviation from this general character, the toes becoming longer and slighter and the claws much weaker.

In the second order of birds, the perchers (*Passeres* of Linnæus), which comprehends sparrows, thrushes, larks, &c., the foot is constructed for another and a very different purpose. Its chief office is to support the bird in a horizontal position upon the boughs and branches of trees and shrubs; hence the foot is long, the toes slender, very flexible, and armed with long, straight, weak claws, which are not at all retractile. All the birds of this order possess four toes, one of which, the hind toe (*hallux*), is placed straight out behind, the others being in front, and those situated externally are connected to the middle ones at their bases. The scales covering the foot are regularly disposed, and as they are not needed for the purpose of defence, they are thin and tender, resembling ordinary scarf skin. Even in the shrikes,—the birds of prey of this order, who

feed upon living creatures and use the foot for securing them, the claws are not sharp, nor is the foot formed in such a manner as to ensure a very secure grasp, and we accordingly find that they merely press this organ upon their prey for the purpose of holding it. In a few other families of this order, as the todies, the kingfishers, &c., the foot is called upon to assist in feeding, and we consequently find certain modifications of structure indicative of this office. In order to strengthen the foot and to secure a firmer grasp, the external and middle toes are united almost to the apex, and the strength of the hind toe is considerably increased.

In the third order, the climbers (*Scansores*), or, as they have been sometimes termed, the yoke-footed, to which the woodpecker and the parrot tribe belong, the structure of the foot is modified for the important purpose of enabling the creature to support itself in all positions upon the stems and branches of trees. In order to effect this the foot is made strong, short, and muscular, the claws sharp and curved, and the toes are placed in a very different position to that which they occupy in other orders, two of them being situated in front and two behind. By such a disposition, a strong, secure grasp is afforded; and thus it is that most birds belonging to this order are enabled to climb in a vertical position, and to effect movements like animals of the monkey tribe. In general these birds move very awkwardly upon a level surface, but in one or two species the structure of the foot is so modified that they can run upon the ground with great speed. This is the case with the travellers' friend of South America, and with the ground parrot of New South Wales; and these creatures have accordingly slender toes so constructed, that one of the two placed behind can be brought in front at will, so that a larger and more secure basis of support is thus afforded.

In the fourth order the scratchers (*Rasores*), to which the common fowl, the pheasant, and the pigeon belong, the foot is adapted for an instrument of active locomotion, as well as for the purpose of procuring food by scratching in the earth. Hence we find it strong, with a long muscular leg, and four toes, three before and one behind, covered with broad scales and armed with short claws. The

thumb, so necessary for perching and climbing, is in birds of this order short, rudimentary, and attached high up in the leg, so that the whole foot being placed flat upon the ground, affords a very firm support to the animal.

In the fifth order of birds, the runners (*Cursores*), to which the ostrich, the emu, and the cassowary belong, the structure of the foot is wholly that of a powerful instrument of locomotion. The leg is long, the thigh strong and muscular, and the foot short and compact. The toes which never exceed two or three in number, and of which the second is the largest, are placed all in front, and armed with very short claws, or, as in the African ostrich, with the outer toe destitute of a claw. The scales are limited to the upper surface of the foot, the under surface being flexible and occupied by an elastic pad upon which the member rests. Such a conformation of limb, which would be wholly useless for perching or climbing, is admirably fitted for running—witness the swiftness of the ostrich—a creature equalling and even surpassing the fleetest horse in speed.

In the sixth order, the waders (*Grallatores*), or stilt birds, as the stork, the crane, the heron, &c., the leg is long and slender, and the foot weak and covered with shield-shaped scales. The toes, four in number, are long and straight, three being placed anteriorly, and a shorter one (wanting in the plovers and lapwings) behind; they are frequently palmated at their base, as in the stork; or, as in the middle claw of the heron, toothed or notched like a saw; while sometimes they have a narrow-winged appendage, running along the side, as in the sandpipers. In search of their food, insects and small fish, the individuals of this order frequent marshy places and shallow waters, and many of them, as the stork and heron, are remarkable for the unerring certainty with which they strike and seize their small finny prey.

In the last order, the swimmers (*Natatores*), called also web-footed birds, to which the goose, duck, and gull belong, the foot is modified to assist in swimming. The legs are short; the four toes, all placed in front, are united by a broad membranous expansion, and armed

with claws, the thumb being likewise brought in front, so that a greater extent of surface may be given to this oar-like member. A foot thus constructed would be wholly unsuited for perching, running, or grasping, but it is well adapted to the wants and habits of these aquatic birds.

*Mammals.*—It is but in animals who suckle their young (*Mammalia*) that the extremities attain their greatest state of developement, and it is in the higher orders alone that they become useful as organs of prehension, their office being limited in most of the lower tribes to support and locomotion. In the lowest order of the series, or whale tribe (*Cetacea*), the members, in the number of pieces of which they are composed, bear a considerable resemblance to the fins of fishes, though they are somewhat differently constructed, according as the animal may be destined exclusively for an aquatic existence, like the common sperm whale, or be more or less herbivorous, and consequently terrestrial in its habits, like the dugong. In the former case, the extremities are converted into broad paddles adapted for swimming, and the feet are webbed; in the latter, the members are better developed, the toes being free, and furnished with nails at their termination.

Of those orders of *Mammalia* which are provided with four members —the ordinary quadrupeds—some are furnished with a foot which appears to be entirely without toes, their place being supplied by a mass of horny tissue—the hoof. This is the case with the ruminants —animals that chew the cud—as the cow, and with the horse; but in the latter, as the name of the order implies (*Solidungula*), the hoof is solid, while in the ruminants it is cleft; and hence by some naturalists these latter animals have been termed *Bisulca*. Some slight differences are perceptible in the construction of the feet of ruminants: thus the chamois, the antelope, and other of the deer tribe, are furnished with an additional toe, which, projecting backwards, affords a firmer support to the body. In the thick-skinned animals (*Pachydermata*) the toes can hardly be said to be free, being still partially enclosed in the tough skin. It is from characters afforded by the foot that several tribes of animals belonging to this

order are mainly characterised: thus the elephant has five toes to each foot, the rhinoceros three, and the hog and hippopotamus four. Among those of the mammalia which are characterised by the presence of four members with distinct and separate toes and nails, but few are furnished with a true hand—that is, a member with a thumb capable of being brought into apposition with the other fingers. Carnivorous animals have either a foot with sharp recurved and retractile claws, as the cat and tiger, or with straight blunt claws, not retractile, as the bear; or the feet are small, almost completely enveloped in the skin, and furnished with a membranous expansion connecting the toes, as in the aquatic seal and walrus, or river-horse: but in all these animals, although the fore-legs may be more or less employed as instruments of prehension, they are not used for the purpose of conveying food to the mouth. In some of the gnawing animals, as the squirrel, the anterior extremity commences to assume the function of a hand; and in a few of the kangaroo tribe, such as the opossum, the hinder extremities are provided with a thumb capable of being brought into apposition with the other toes. The hand of bats, which serves these animals not merely for flying, but also supplies the place of eyes and ears, enabling them to avoid objects during the obscurity of night, is furnished with a sense of touch extremely delicate. It is in man and the monkey tribe only that we meet with a true and perfect hand. In the latter, both the fore and hind extremities are constructed upon the same general principle as the hand of man; and hence these animals have been styled four-handed (*Quadrumana*).

"In man the upper members are disposed in a manner the most favourable for the exercise of their functions as organs of prehension and of touch: the fingers are long and flexible; they have all, with the occasional exception of the ring-finger, separate movements, which other animals (even those provided with hands) have not; the thumb, which is apposable to these latter, is longer in proportion to the fingers than in monkeys, and consequently can more readily apply itself to the extremity of their palm or surface, and better seize small objects. The nails, which are large and flat, cover the back part

only of the extremity of the fingers, so as to furnish a support to the organs of touch without in the least depriving them of their delicacy. The entire hand can execute rotatory movements the most extended; and to the arm which supports it is afforded a solid attachment by means of a large shoulder or blade-bone and a long collar-bone." The statement of Milne Edwards,[3] then, does not appear far removed from the truth, "That the faculties of the *Mammalia* are the more elevated in proportion as their members are the better constructed for prehension and for touch."

## USE OF A KNOWLEDGE OF THE FORM OF APPENDAGES TO TRUNKS IN GEOLOGY.

A knowledge of the form of the appendages to the trunk of animals is of great service to the geologist, for it has been well and truly said, that the organic remains imbedded in rocks are as medals struck in commemoration of the great revolutions which the earth has undergone, and so small a portion as the extremity of an animal is sufficient to indicate its nature, and to enable us to ascertain the class and order to which it belongs. Let us take a few examples. Some fossil bones were discovered by General Washington near his seat in Virginia. Mr. Jefferson, by whom they were examined, stated that they had belonged to an enormous carnivorous animal, which from the size of its claws he named the *Megalonyx*. Upon an examination more carefully conducted by Cuvier, it was found that in the paw the second bone of the toe was symmetrical, while in animal feeders furnished with retractile claws it is curved, and not symmetrical; the first bone, too, was the shortest, whereas in the lion and others of the feline tribe it is the longest. Whence Cuvier was led to conclude that the creature in question was a sloth of large dimensions, which fed only upon plants.

Upon another occasion, from a careful consideration of the form and size of a toe found in the Palatinate, near Eppelsheim, Cuvier was able to determine that the animal to which it belonged was of the edentate tribe of *Pangolins*. It was from an examination of the hand that Cuvier decided upon the nature of the *Pterodactylus*. This

curious animal partook of the nature of both the reptile and the bird. Like the bird, it was furnished with a long neck and a horny beak, but in its jaws and teeth it resembled the crocodile. It had not, however, like the bird, feathered wings without fingers to strengthen them, nor had it a wing in which the thumb alone is free, like that of the bat. Instead of the bony pieces of all the fingers being equally prolonged, the second finger only was extended to a great length, and from it the wing spread out, the other fingers being short and furnished with nails like the toes of ordinary animals. Collini, its discoverer, supposed it to be of marine origin; Soemmerring contended that it was a mammal; but its true place in the animal series was first assigned to it by Cuvier, who has satisfactorily shewn that it is in fact intermediate between a bird and a reptile.

A knowledge of the form of the extremities of animals has been of great service to palæontology in another way—in proving the existence of certain species of animals at given periods of the earth's formation, from the print of their footsteps left upon the sand or other material of the strata while it was yet in a soft state. Such traces were first observed by Dr. Duncan in Dumfries-shire. On examining a sandstone quarry, he found these prints not on one only, but on several successive layers of the stone; so that they must have been made at periods distant from each other. Similar impressions have been since observed in the Forest marble-beds near Bath, at Hessburg in Saxony, in the State of Connecticut, and in some other parts of the world.

"The marks found in Dumfries-shire, of which there were as many as twenty-four upon a single slab, formed as it were a regular track, with six distinct repetitions of each foot, the fore and hind feet having left different impressions, and even the marks of the claws being discernible. They appear to have been made by some animal of the tortoise kind. At Hessburg the impressions were discovered in quarries of grey and red sandstone alternating; and the marks were both larger and more distinct than those found in Scotland. In one the hind foot measured twelve inches in length, and the fore foot always appeared much smaller than the hind. From this

circumstance, and from the distance between the two being only fourteen inches, it is conjectured that the animal was a marsupial like the kangaroo, and it has been termed by Dr. Kaup *Chirotherium*, from the supposed resemblance of the four toes and turned-out thumb to a hand. In the State of Connecticut, near Northampton, footsteps differing exceedingly in size have been found in inclined strata of sandstone. They were evidently made before it assumed its present position. The marks are always in pairs, and the tracts cross each other like those of ducks on the margin of a muddy pond. One is of the length of fifteen or sixteen inches, and a feathery spur or appendage appears to have been attached to the heel, eight or nine inches long. The distance between the steps is proportioned to their length, but in every case the pace appears to have been longer than that of the existing species of birds to which they approach nearest —the ostrich, and the animal must consequently have been proportionably larger. How much larger he was than the ostrich may be gathered from this, that the large African ostrich has only a foot ten inches long, less than two-thirds that of this bird, and yet stands nine feet high. These proportions would give a height of fourteen feet to the extinct animal."[4]

The characters afforded by the foot have recently enabled Mr. Strickland to determine that the dodo, a bird now extinct, is not related either to the gallinaceous birds,—the vulture or the ostriches as some have conjectured,—but is closely allied to the pigeons.

From this cursory examination of the animal world we may gather the important conclusion, that from the structure of an extremity we may obtain a complete insight into the entire organisation of an animal; and thus the paws furnished with sharp retractile claws of the lion indicate at once to a naturalist its strong teeth, its powerful jaws, and its muscular strength of limb; while from the cleft foot of the cow, the complicated structure of its stomach, the definite peculiarities of its jaws, and its vegetable diet, may with equal certainty be predicated.

Thus, as Paley justly observes, "In the swan, the web foot, the spoon bill, the long neck, the thick down, the graminivorous stomach, have all a relation to one another, inasmuch as they all concur in one design, that of supplying the occasions of an aquatic fowl, floating upon the surface of shallow parts of water, and seeking its food at the bottom. Begin with any one of these peculiarities of structure, and observe how the rest follow it. The web foot qualifies the bird for swimming, the spoon bill enables it to graze. But how is an animal, floating upon the surface of pools of water, to gaze at the bottom except by the mediation of a long neck? And a long neck is accordingly given to it. Again, a warm-blooded animal, which was to pass its life upon water, required a defence against the coldness of that element. Such a defence is furnished to the swan in the muff in which its body is wrapped. But all this outward apparatus would have been in vain if the intestinal system had not been suited to the digestion of vegetable substances."[5]

And, again, of the mole: "The form of the feet fixes the character of the animal. They are so many shovels; they determine its action to that of rooting in the ground; and every thing about its body agrees with this destination. The cylindrical figure of the mole, as well as the compactness of its form, arising from the terseness of its limbs, proportionally lessens its labour; because, according to its bulk, it thereby requires the least possible quantity of earth to be removed for its progress. It has nearly the same structure of the face and jaws as a swine, and the same office for them. The nose is sharp, slender, tendinous, strong; with a pair of nerves going down to the end of it. The plush covering, which, by the smoothness, closeness, and polish of the short piles that compose it, rejects the adhesion of almost every species of earth, defends the animal from cold and wet, and from the impediment which it would experience by the mould sticking to its body. From soils of all kind the little pioneer comes forth bright and clean. Inhabiting dirt, it is of all animals the neatest."

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